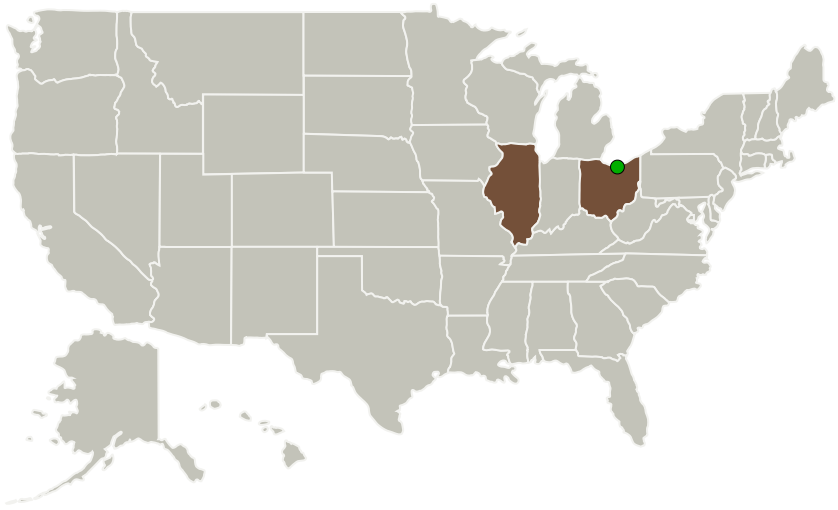
Radiation Tolerant 35% Efficient Phosphide-Based 4-Junction Solar Cell with Epitaxial Lift-Off, Phase I

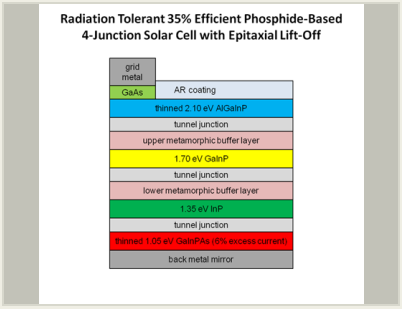
Completed Technology Project (2017 - 2017)

Project Introduction

MicroLink proposes to develop a phosphide-based ELO-IMM four-junction (4J) solar cell that will enhance the performance and capabilities of solar photovoltaic arrays for a variety of future NASA missions. Relative to state-of-the-art incumbent GaInP/GaInAs/Ge 3J space solar cells, the proposed phosphide-based 4J solar cell has superior radiation tolerance, higher beginning-of-life (BOL) and end-of-life (EOL) efficiencies, lower areal mass density, higher specific power, and lower cost. The improved radiation tolerance is enabled by eliminating arsenide-based subcells in favor of only phosphide-based subcells. A reduction in the mass of the solar cell relative to incumbent technology is enabled by removal of the thick GaAs substrate. Cost savings compared to incumbent technology are enabled by the recovery and reuse of the substrate via the ELO process. The superior radiation tolerance can also relax the requirements for radiation shielding, enabling further reductions in array mass and stowed volume.

Primary U.S. Work Locations and Key Partners





Radiation Tolerant 35% Efficient Phosphide-Based 4-Junction Solar Cell with Epitaxial Lift-Off, Phase I Briefing Chart Image

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

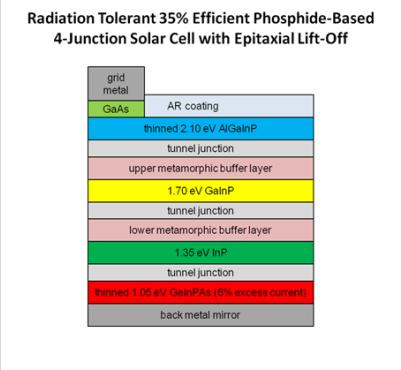
Radiation Tolerant 35% Efficient Phosphide-Based 4-Junction Solar Cell with Epitaxial Lift-Off, Phase I

Completed Technology Project (2017 - 2017)

Organizations Performing Work	Role	Type	Location
MicroLink Devices, Inc.	Lead Organization	Industry Minority-Owned Business	Niles, Illinois
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Illinois	Ohio

Images



Briefing Chart Image
Radiation Tolerant 35% Efficient Phosphide-Based 4-Junction Solar Cell with Epitaxial Lift-Off, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/131812)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
MicroLink Devices, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

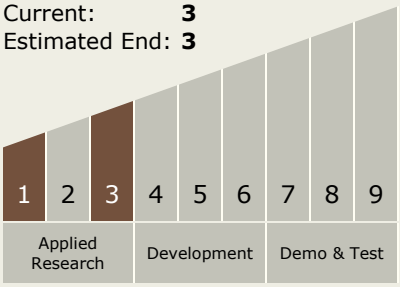
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Drew Cardwell

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Radiation Tolerant 35% Efficient Phosphide-Based 4-Junction Solar Cell with Epitaxial Lift-Off, Phase I

Completed Technology Project (2017 - 2017)

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System